

### Amendment to the Claims

The current status of all the claims of the application follows:

1. (Currently amended) A process for the manufacture of a catalyst for selective hydrogenation of a feed stock comprising  
preparing a catalyst support from a carrier material selected from the group consisting of alumina, zinc oxide, nickel spinel, titania, magnesium oxide and cerium oxide,

impregnating the catalyst support with a palladium metal source,

reducing the palladium-impregnated catalyst with a reducing material,

without permitting the reduced catalyst to reoxidize, placing the reduced catalyst in a container under a non-oxidizing material, and

distributing the prereduced catalyst in the container to a customer while maintaining the reduced catalyst under the non-oxidizing material.

2. (Original) The process of Claim 1 wherein the temperature of reduction of the catalyst is from about 50°F to about 1000°F (10°C to 538°C).

3. (Original) The process of Claim 1 wherein the non-oxidizing material is selected from the group consisting of carbon dioxide, nitrogen, helium, neon and argon.

4. (Original) The process of Claim 1 wherein the non-oxidizing material is nitrogen.

5. (Original) The process of Claim 1 wherein the non-oxidizing material is carbon dioxide.

6. (Original) The process of Claim 1 wherein palladium comprises from about 0.001 to about 0.028 weight percent of the catalyst, based on the total weight of the catalyst.

7. (Original) The process of Claim 1 wherein the catalyst further comprises a metallic additive selected from the group consisting of silver, tin, copper, gold, lead, thallium, bismuth, cerium and alkali metals.

8. (Original) The process of Claim 1 wherein the catalyst further comprises a metallic additive selected from the group consisting of silver, gold, thallium and alkali metals.

9. (Original) The process of Claim 1 wherein the catalyst material further comprises silver as an additive.

10. (Original) The process of Claim 9 wherein the catalyst material comprises from about 0.01 to about 0.02 weight percent palladium, from about 0.04 to about 0.15 weight percent of silver, wherein the ratio of the silver to the palladium is from about 1:1 to about 20:1, and wherein the weight percentages are based on the total weight of the prereduced catalyst.

11. (Original) The process of Claim 1 wherein the selective hydrogenation process comprises a front-end hydrogenation process.

12. (Original) The process of Claim 1 wherein the selective hydrogenation process comprises a tail-end ethylene purification process.

13. (Original) The process of Claim 1 wherein the feed stock comprises a C<sub>2</sub> and C<sub>3</sub> olefinic feed stock.

14. (Original) A catalyst prepared by the process of Claim 1.

15. (Canceled)

16. (Canceled)

17. (Canceled)

18. (Canceled)

19. (Canceled)

20. (Canceled)

21. (Canceled)

## Discussion

The United States Patent and Trademark Office rejected Claims 1 - 14 under 35 USC Section 103 as being unpatentable over Wood, et. al., U.S. Patent No. 4,748,145. In addition, the Examiner rejected Claim 14 under 35 USC Section 102(b) as being anticipated by, or in the alternative, under 35 USC 103, as obvious over Wood, et. al. The applicants respectfully traverse each of these rejections.

The applicants have discovered a unique process for preparation of a selective hydrogenation catalyst with a particular composition. The particular catalyst of the invention with its unique composition is produced by a novel process whereby the precursor catalyst is prereduced and distributed to customers in its prereduced status in shipping containers under a non-oxidizing material. While the conventional procedure for production of selective hydrogenation catalysts requires reduction of the catalyst *in situ*, the applicants have surprisingly discovered that catalysts, which are prereduced ex situ, exhibit improved selectivity, resistance to run-away, tolerance to CO concentration swings and improved performance at higher gas hourly velocities. (See the results shown in Tables 1 - 4.) The process of prereduction of the catalyst *ex situ* is critical to the enhanced performance of the particular selective hydrogenation catalysts of the invention.

The sole reference cited against the claims of the application is Wood, et. al., Wood, et. al. disclose a catalyst composition comprising a catalytic metal placed on a support, wherein the support is prepared by depositing a metal alkoxide on a core material. The catalyst support can then be used as the common carrier for various catalysts of different composition for a number of different catalytic procedures including methanation (col. 5, line 62,), olefin metathesis (col. 6, line 37), carbonylation (col. 8, line 27), and hydrogenation (col. 14, line 28 et. seq.).

Thus, while Wood, et. al. may disclose various processes for the manufacture of a catalysts, its primary disclosure is directed only to the composition of the support for the various catalysts. All of the catalysts which are disclosed in Wood, et. al. utilize this unique support material, which has been modified by the addition of an alkoxide, (See Claims 1 - 16, col. 25 and 26). The use of this alkoxide material distinguished Wood, et. al. from the prior art catalysts. Without the presence of this alkoxide material in the carrier, virtually all of the disclosures in Wood, et. al. would have been known.

The carrier for the catalyst of the process, as claimed, is entirely different from that of the alkoxide-based carrier of Wood, et. al. This difference is emphasized by the amendment that has been made to Claim 1 of the instant application, wherein the catalyst support is described as a carrier material "selected from

the group consisting of alumina, zinc oxide, nickel spinel, titania, magnesium oxide and cerium oxide." As the catalyst support of the catalyst of the application can not contain an alkoxide, the process for manufacture of the catalyst of Claim 1 must be distinctive from the process disclosed in Wood, et. al.

Wood, et. al. also failed to recognize the importance of the critical process steps of the process of manufacture that is used by the applicants for their invention. While Wood, et. al. disclosed that their alkoxide-based catalyst could be stored under an inert atmosphere, the clearly preferred process disclosed by Wood, et. al. utilized *in situ* reduction. In fact, of the numerous preparations disclosed in the examples from Col. 17 through Col. 25, none teaches prereduction and placement of a catalyst under an inert atmosphere. Note particularly that the Wood, et. al. examples which disclose a process for preparation of a selective hydrogenation catalyst, i.e. Examples 10 and 11, specifically failed to disclose prereduction and placement of the catalyst under an inert atmosphere. (See col. 23 - 24.) Thus, Wood, et. al. failed to recognize this crucial process step. In contrast, prereduction of the catalyst is a required element in each of the processes of production for the selective hydrogenation catalysts of the invention, as claimed. Accordingly, Wood, et. al. failed to recognize the importance of prereduction and storage of the prereduced catalyst under an inert environment as necessary process

steps.

A person "skilled in the art" reviewing the disclosure of Wood, et. al. would thus be taught away from the claimed prereduction step as it was not disclosed in any example and was not claimed in any claim of Wood, et. al. Accordingly, the USPTO has not demonstrated a *prima facie* case of obviousness of the claims of the application.

#### **Dependent Claims.**

The Examiner specifically asserted that it is "old and known" to use nitrogen and helium as non-oxidizing gases. That knowledge is not sufficient to disclose the claimed disclosures of dependent Claims 3 - 5, which claim specific non-oxidizing materials for the claimed process. In order for a disclosure in a single reference to teach the claimed invention, there must be motivation within that reference to combine the teachings with other disclosures either in the reference or within the common knowledge. (See, In re. Rouffet, 47 USPQ 2nd 1453 (Fed. Cir. 1998)). The mere fact that nitrogen and helium are known as non-oxidizing gases is not sufficient to teach a person skilled in the art to reduce a palladium-impregnated catalyst with a reducing material and then, without permitting the reduced catalyst to reoxidize, store that reduced catalyst in a container under the claimed non-oxidizing gases. A person skilled in the art would first have to recognize

the importance of placing the prereduced catalyst material in a container under a non-oxidizing material before the choice of the non-oxidizing material is ever even necessary. It is clear that Wood, et. al. failed to recognize that this surprising process step produces an improved selective hydrogenation catalyst. Further, Wood, et. al. failed to recognized that a preferred non-oxidizing material for this particular process step was nitrogen (Claim 4) or carbon dioxide (Claim 5). The use of either of these non-oxidizing materials for this particular process step is specifically not disclosed in Wood, et. al. or taught inherently by the prior art or common knowledge in the art.

In addition to the failure of Wood, et. al. to recognize the importance of prereduction plus retention of the catalyst under a non-oxidizing material, Wood, et. al. also failed to recognize the importance of the choice of additives that should be added to the palladium-impregnated catalyst of the invention. While, Wood, et. al. recognized that additives could be added to a palladium-impregnated selective hydrogenation catalyst, (col. 16, lines 39 - 41), they failed to recognize the particular additives that are preferred by the applicants and they specifically failed to recognize the quantity of the additives that was preferred.

The applicants have discovered that silver is a particularly preferred additive (Claim 9) and that the quantity of the silver used as an additive must be equal to or greater than the quantity



of the palladium. This concept contrasts with the common knowledge that additives are normally added only in extremely small quantities. In addition, Wood, et. al. specifically failed to recognize that silver is the preferred additive. Further, Wood, et. al. clearly failed to recognize that the ratio of silver to the palladium must be from 1:1 to 20:1, as claimed in Claim 10. In fact, the Examples in Wood, et. al. do not disclose the use of any additive, much less the use of silver as the particularly preferred percentages. The limited disclosure in the Wood, et. al. specification (col. 16, lines 39 - 41) of the possible use of additives fails to disclose to a person skilled in the art the particularly preferred compositions, as claimed in Claims 7 - 9, or the quantities of those compositions as claimed in Claim 10. The degree of experimentation that would have been necessary to disclose the invention is significant. At best, Wood, et. al. may teach that it was "obvious to experiment", a standard not sufficient to teach the claimed invention. See In re Dow Chemical Co., 5 U.S.P.Q. 1529, 1532 (C.A.F.C. 1988).

Accordingly, the applicants assert that there was no recognition by Wood, et. al. that a catalyst, prepared with a carrier entirely different from the carrier that was the primary basis for allowability of Wood, et. al., would have exhibited superior performance if the process of the claims was utilized. Further, there was no recognition that a catalyst with the

particular composition as claimed in the dependent claims, particularly dependent Claim 10, formed by the claimed process, would function as a superior selective hydrogenation catalyst. Finally, there was no recognition that a catalyst of this specific composition, formed by the claimed process, would exhibit the improved performance as shown in the examples of the application.